UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF INFORMATION
PRESS SERVICE

Picture Story No. 58

January 16, 1949

UNDER-PASTEURIZATION OF DAIRY PRODUCTS DETECTED BY CHEMICAL TEST

A test developed by the Bureau of Dairy Industry of the U. S. Department of Agriculture shows reliably and accurately whether or not milk and cream have been pasteurized and whether or not various manufactured dairy products are made from pasteurized milk. This test gives both milk processors and manufacturers of dairy products a way to check on the adequacy of their pasteurization processes. It also provides public-health officials and other control agencies with a means for determining whether or not milk, cream, and certain manufactured dairy products meet the legal requirements for pasteurization. It can be used successfully on fluid milk, cream, all hard, soft, and processed cheeses and cheese spreads, butter, buttermilk, fermented milk drinks, ice cream and sherbet, chocolate milk, cheese whey, and goat's milk.

The test is based on the fact that all raw milk contains a phosphatase enzyme, and that this enzyme can be destroyed by heat. Pasteurization, which is the heating of milk at a temperature a few degrees higher than that required to destroy the most resistant of the pathogenic or disease-producing organisms that may occur in milk, destroys the enzyme. Thus the absence of the phosphatase enzyme in the milk indicates that it was adequately pasteurized.

The test makes it possible to detect a decrease of as little as a single degree Fahrenheit in the pasteurizing temperature. It will reveal, for example, the presence of 1 pound of raw milk in 2,000 pounds of properly pasteurized milk, whether the test is applied to milk or to products made from milk. As the enzyme is more concentrated in cream, the test can show the presence of raw cream added to properly pasteurized cream in the ratio of 1 to 5,000.

The steps in the new test for under-pasteurization, named for the two dairy products chemists - George P. Sanders and Oscar S. Sager - who developed it, are as follows:

A sample of the dairy product under test is crushed down into a test tube. A barium borate "buffer" solution, which contains a substrate known as phenyl phosphate, is added. This liquid adjusts the alkalinity of the cheese to the proper point. The samples, with the buffer solution added, are placed in a water bath at about body temperature, or 99° F., and left there for one hour. It is here that the phosphatase enzyme, present in under-pasteurized products, "breaks down" the phenyl phosphate (substrate) into free phenol and phosphate. The extent of the reaction depends on the amount of phosphatase enzyme present. After being removed from the bath, the samples are heated momentarily to 175° F. to stop the enzyme action. Then a zinc-copper precipitant is added and the samples are filtered. Filtering removes the proteins, which would interfere with the test, and a water-clear filtrate results. Another buffer (sodium chloride and sodium metaborate) is added to a measured portion of the filtrate to again adjust the alkalinity to the proper point. Next a few drops of "BQC" are added. This substance (di-bromo chloroimine) will quickly impart an intensely blue color to the filtrate if phenol is present. The presence of phenol (and the resulting blue color) indicates that the cheese was made from raw (under-pasteurized) milk. Then the tubes are ready for visual color readings. A practically colorless solution indicates that the cheese sample was made from pasteurized milk; a slightly blue solution, that the milk was not properly pasteurized before it was made into the cheese; and a very blue solution, gross under-pasteurization, or that raw milk was used to make the cheese. For practical purposes, an experienced operator can determine the results visually. But for absolutely accurate determinations, the amount of blue color is measured in a photoelectric colorimeter. The measurement is so precise that one-millionth of a gram of phenol in 10 milliliters of solution can be detected.

The steps in the Sanders-Sager test, as conducted by Dr. George P. Sanders, in the Department's dairy products research laboratories, are shown on the other side of this sheet. Glossy 8x10 prints of any of the pictures here shown in miniature are free to writers and editors on request to the Press Service, Office of Information, U. S. Department of Agriculture, Washington 25, D. C.

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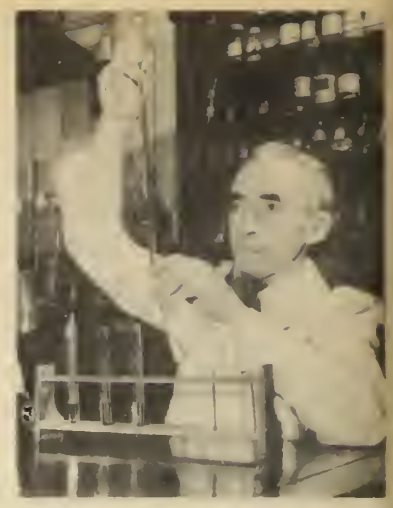
DETECTED BY CHEMICAL TEST

2. Dr. Sanders prepares a 1/2-gram sample of cheese for the tast

1. The phosphatase test, developed by George P. Sanders and Oscar S. Sager, chemists in the dairy products research laboratories of the Bureau of Dairy Industry, U. S. Department of Agriculture, can be used to determine whether or not the milk used in manufacturing practically any dairy product was pasteurized.



6. Again he adds a buffer solution

3. He adds the "buffer" solution

5. He filters the samples to which the zinc-copper precipitant has been added

7. And then adds a few drops of "BQC"

4. He places two samplaa in the water bath

9. For an absolutely accurate determination he measures the amount of blue color in a photoelectric colorimeter

8. He determines the results of the test visually by noting the color of the liquid in each test tube